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Tiny LDO Cuts Quiescent Current To <25 nA

Texas Instruments' TPS7A02, a low-power low-dropout regulator (LDO), is said to offer the industry's lowest quiescent current with an (I_Q) less than 25 nA. That is one-tenth the I_Q of competing ultra-small devices, according to the company (Fig.1). Offered initially in a 1-mm by 1-mm 4-pin small outline no-lead (X2SON) package and later in the even smaller 0.65-mm by 0.65-mm 4-pin DSBGA and the larger 2.9-mm by 1.6-mm 5-pin SOT-23, the regulator features low I_Q control at light loads even in dropout conditions, extending battery life.

In addition, the LDO boasts best-in-class transient response for faster wake-up, improving application response times and dynamic performance. The small solution footprint helps engineers design smaller, lighter, more efficient products quickly by reducing power-supply solution size, and its common industry packages allow for pin-to-pin drop-in replacement in existing designs. The TPS7A02 targets power-sensitive, high-precision and low-power applications such as in the grid infrastructure, building automation, medical equipment and wearables markets.

According to the vendor, the TPS7A02's ultra-low I_Q control at light loads allows engineers to at least double the battery life for applications using a standard battery chemistry, such as lithium-ion. For example, using the TPS7A02 in wireless video doorbell and security camera designs, engineers can achieve 24 months or more of battery life (up to four times the industry standard, says TI). In addition, the TPS7A02's ultra-low shutdown I_Q of 3 nA is said to extend battery shelf life by as much as five times in portable medical and wearable applications compared to competing devices.

The TPS7A02 can settle in less than 5 µs for 1-to-50-mA load transients—half the time of competing devices, according to TI (Fig.1). With the ability to quickly respond to rapidly changing loads while providing minimal variation in output voltage, the TPS7A02 can benefit high-precision, low-power applications such as wireless IoT and portable medical devices, which require clean power to accurately acquire signals from around the body.

The TPS7A02 automatically transitions from an I_Q-saving, low-load state to a high-load, fast-transient state without the need for any external circuitry or components. As a result, engineers can use the TPS7A02 to shrink the solution size by 70%, says TI, adding more functionality to their designs in space-constrained applications or lowering system cost by using smaller boards.

Pre-production samples of the TPS7A02 are now available through the TI store in the 4-pin X2SON. The 5-pin SOT-23 and 4-pin die-size ball grid array (DSBGA) package will be available in early 2020. Pricing starts at $0.49 in 1,000-unit quantities. In addition, the universal LDO linear voltage regulator evaluation module, MULTIPKGLDOEVM-823, is available for $20. For more information, see the TPS7A02 product page.

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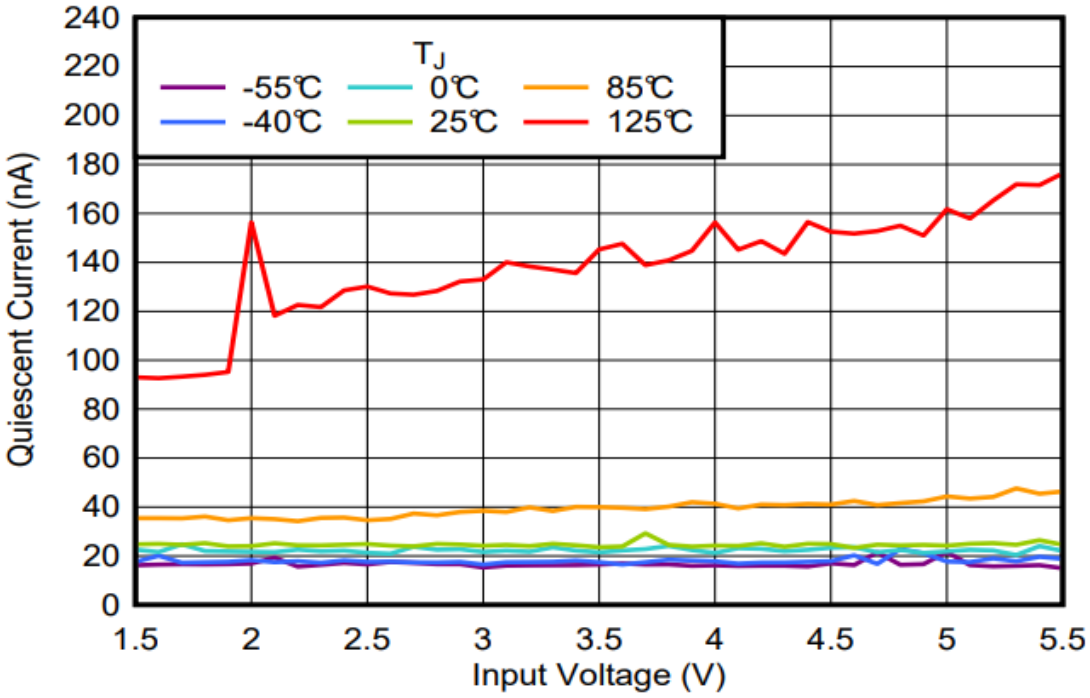

Fig. 1. Quiescent current vs input voltage for the TPS7A02 nanopower LDO at I_{OUT} = 0 A and C_{OUT} = 1 µF. The TPS7A02 is fully specified for T_J = –40°C to +125°C operation. At temperatures up to 85°C, the quiescent current stays below about 50 nA over the input voltage range.

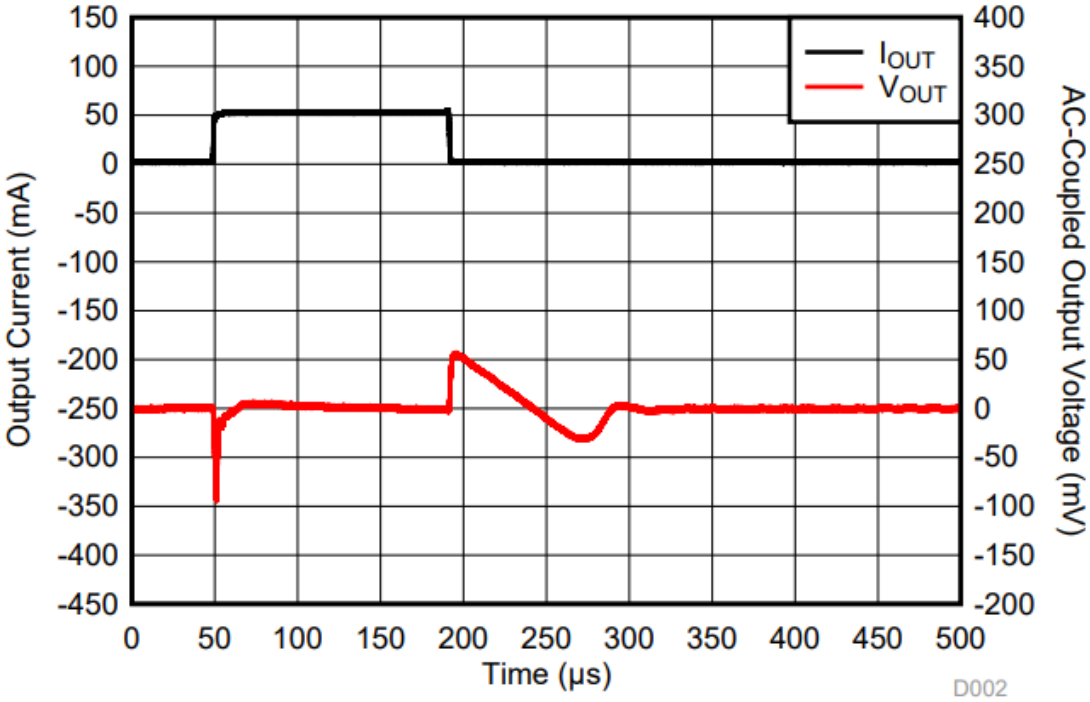

Fig. 2. Load transient response for the TPS7A02 at V_{IN} = V_{OUT} + 1 V, C_{IN} = 0.47 µF and I_{OUT} = 1 mA to 50 mA in 1 µs.